REMARKS

This responds to the Final Office Action mailed on April 21, 2008.

No claims are amended, claims 10, 14-15, 19-23, 27-31, 35-37, 51-52, 54-56 and 62 are canceled without prejudice, and no claims are added; as a result, claims 1-2 and 6-9 are now pending in this application.

Applicant has cancelled claims 10, 14-15, 19-23, 27-31, 35-37, 51-52, 54-56 and 62 without prejudice or waiver of patentable content contained therein, and reserves the right to resubmit these claims in a new application at a later date.

§103 Rejection of the Claims

Claims 1-2, 6-7, 14-15, 19-20, 51-52, 56 and 62 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ma et al. (U.S. Patent No. 6,207,589) in view of Park (U.S. Patent No. 5,795,808) and Yano et al. (U.S. Patent No. 5,810,923). Applicant respectfully traverses this rejection. Claims 14-15, 19-20, 51-52, 56 and 62 are cancelled herein

Applicant respectfully disagrees with the Examiner's characterization of the cited references. Applicant submits that the primary cited reference of Ma would be clearly understood by one of ordinary skill in the art to suggest the use of a heavily doped metal layer, which is then oxidized to form transistor gate dielectric. Applicant submits that the reference's teachings and suggestion are extremely clear.

For example, Ma teaches a high dielectric constant film "that remains amorphous at relatively high annealing temperatures" by use of "either Zr or Hf, doped with a trivalent metal, such as Al". These teaching are found in the Abstract, with similar language in virtual every single paragraph and in every independent claim, including col. 1, lines 35, 41, 53, 60, 61, 64; col. 2, lines 2, 21, 24, 27, 29, 37, 39, 43, 49, 61, 68; col. 3, lines 3, 13, 34, 36, 45, 50, 61, 63; col. 4, lines 1, 5, 14, 20, 21, 28, 29, 46, 57, 64; col. 5, lines 44, 53, 62, 65 (listing the range of 0-50%); col. 6, lines 21, 23, 26, 34, 42, 46, 51, 60; col. 7, lines 6, 9, 11, 17, 21, 22, 31, 47, 65; col. 8, lines 20, 25, 27, 31, 37, 56, 61, 67; col. 9, lines 6, 8, 13, 17; and col. 10, line 18.

Applicant respectfully submits that the Examiner is incorrect to maintain that Ma discloses "a substantially pure single metal layer" (see page 3 of the outstanding Office Action)

and pointing to col. 2, lines 65-67; col. 3, lines 53-55 and 60-62; and col. 5, lines 65-66" as proof of the suggestion of pure metal. The cited sections of the Ma reference are taken out of context and used to mischaracterize the reference. For example, the cited section of col. 2, lines 65-67 reciting "a metal selected from the group consisting of zirconium (Zr) and hafnium (Hf), and oxygen", is the second half of a sentence clearly teaching a "film including a trivalent metal, such as aluminum (Al), scandium (Sc), or lanthanum (La), ..." and then concluding with the incomplete portion cited by the Examiner to indicate that only a pure metal is being taught.

As a second example, the Examiner cites col. 3, lines 53-55, to support the erroneous contention that Ma suggests a single pure metal. The cited section recites "In short, it was discovered that doping a ZrO2 film, with a trivalent metal such as Al, results in that film remaining amorphous under typical (high temperature) processing conditions", which again clearly teaches a very non-pure metal and specifically states that it is teaching doping of metal. Applicant submits that the reference fairly teaches deposition of Zr or Hf with up to 50% of a trivalent metal such as aluminum, with 25% being taught as the preferred level. This teaching of the importance of the use of extremely impure metal is repeated throughout the cited reference which fairly teaches that the doping with trivalent materials causes the film to "resist the formation of a crystalline structure, interfaces to adjacent films have fewer irregularities", and "the film can be made thin to support smaller transistor geometries, while the surface of the channel region can be made smooth to support high electron mobility". The figures show the properties, such as IV characteristics, leakage currents, time dependent dielectric breakdown voltages, and time to failure plots, of trivalent doped metals with up to 50% trivalent, and show that low doping levels have worse results.

As a third example of the incorrect and incomplete characterization of the Ma reference, the Examiner points to col. 3, lines 60-62 to prove that the metal is pure. The cited section should properly include the preceding sentence and states "The present invention is a thin film having a high dielectric eonstant, with respect to silicon dioxide, which comprises a trivalent metal, a metals selected from the group consisting of zirconium (Zr) and hafnium (Hf), and oxygen. The high dielectric film is resistant to crystallization, remaining amorphous for form a smoother surface. The trivalent metal is selected form the group consisting of aluminum (Al),

scandium (Sc), and lanthanum (La)" which is submitted to once again strongly suggest an alloy, and not a pure metal of any sort, in contradiction to the Examiner's suggestion.

As a fourth example, the Examiner cites col. 5, lines 65-66" as proof of the suggestion of pure metal in Ma. The cited section states "The percentage of Al, or other trivalent metal, in film 56 is in the range of approximately 0 to 50%", which is supposed to suggest that the lower end of the range of 0% is suggested. However, the next sentence in this paragraph following the cited sentence states "Preferably, the percentage of Al in film 56 is approximately 25%", which is conjunction with the use of the term alloy and trivalent metal in virtually every preceding paragraph is submitted to clearly teach away from a pure metal. The figures show the improvement to be found by use of 25% alloys of trivalent metal, and no one of ordinary skill in the art could possibly be motivated to use a pure metal (i.e., 0% alloy) by reading this reference which strongly teaches away from the use of pure metals.

Applicant respectfully submits that essentially the entire teaching of Ma is towards heavily doped metals. At col. 2, lines 58-62 Ma teaches that it "would be advantageous if improved high-k dielectric materials could be formed by simply doping ... additional elements" into metal oxides. At col. 2, lines 1-3, the reference teaches doping a high-k dielectric with heavy amounts of another material to prevent "the formation of an interfacial SiO_2 layer" (col. 1 lines 45-47) by the addition of a "trivalent metal" around 50% (col. 2, lines 1-3). Ma does not teach the use of pure metals, and metal purity is never mentioned.

Park is used to show that sputtering and evaporation are art recognized equivalents Applicant submits that the present application teaches why the use of sputtering is NOT equivalent to evaporation, and may cause the rough surface and crystal damage (see figure 2b and page 3, lines 17-23, page 7, line 22). This damage increases the leakage current through the gate oxide by a factor of ten times for each 0.1 nm increase in roughness (see page 3, line 1).

Yano is used to show that the deposition of a pure metal, the oxidation of metal, and that smooth metal oxide surfaces are known. Yano teaches the deposition of an oxide from a metal alloy having 75% rare earth metal (col. 8, line 33) in a vacuum chamber with an oxidizing gas (col. 8, line 57) to form an epitaxial oxide layer. Yano does not cure the other reference's failure to suggest a pure metal, and the Examiner is incorrect to suggest that it teaches an amorphous dielectric (as taught in Ma) since "epitaxial" is by definition not amorphous. Yano teaches

against amorphous materials, against pure metals, and against direct contact of dielectric to semiconductor material.

Specifically, Applicant respectfully submits that the suggested combination of Ma with Park and Yano fails to describe or suggest at least the claimed feature of a "*...evaporation depositing a substantially amorphous and 0.99999 pure single element metal layer directly contacting a single crystal semiconductor portion of the body region using electron beam evaporation at a temperature between 150 to 200 °C...*", as recited in independent claim 1. The combination of cited references, whether taken alone or in any combination, do not suggest pure metal, or thermal evaporation (compared to sputtering), or directly contacting the semiconductor body region with the dielectric layer.

The dependent claims are held to be patentable at least as depending from patentable base claims as shown above, since any claim depending from a nonobvious independent claim is also nonobvious. See M.P.E.P. § 2143.03. In view of the failure of the suggested combination of references to describe or suggest pure metal, amorphous oxide, or direct contact between the oxide and the substrate, Applicant requests this rejection under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Claims 8-10, 21 and 54 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ma et al. (U.S. Patent No. 6,207,589) in view of Park (U.S. Patent No. 5,795,808) and Yano et al. (U.S. Patent No. 5,810,923) as applied to claims 1-2, 6-7, 14-15, 19-20, 51-52, 56 and 62 above, and further in view of Moise et al. (U.S. Patent No. 6,211,035). Applicant traverses this rejection. Claims 10, 21 and 54 are cancelled herein.

The cited references of Ma, Park and Yano are discussed above. Moise is used to show that annealing in an inert ambient such as krypton, and in conjunction with the oxidizing anneal of Ma are known. Applicant disagrees with the Examiner's suggestion regarding the teachings of Moise and the motivation to combine with Ma, but whether or not such motivation exists, the suggested combination still does not result in all the recited features of the present claims.

Applicant respectfully submits that the suggested combination of Ma with Park, Yano and Moise, whether taken alone or in any combination, fails to describe or suggest at least the claimed feature of a "*...evaporation depositing a substantially amorphous and 0.99999 pure*

single element metal layer directly contacting a single crystal semiconductor portion of the body region using electron beam evaporation at a temperature between 150 to 200 °C...", as recited in independent claim 1. The reasoning is the same as that given above with reference to the prior rejection.

The dependent claims are held to be patentable at least as depending from patentable base claims as shown above, since any claim depending from a nonobvious independent claim is also nonobvious. See M.P.E.P. § 2143.03. In view of the failure of the suggested combination of references to describe or suggest the above noted features, Applicant requests this rejection under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Claims 22-23, 25, 27-28, 30-31, 33 and 35-36 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ma et al. (U.S. Patent No. 6,207,589) in view of Park (U.S. Patent No. 5,795,808) and Yano et al. (U.S. Patent No. 5,810,923) as applied to claims 1-2, 6-7, 14-15, 19-20, 51-52, 56 and 62 above, and further in view of Maiti et al. (U.S. Patent No. 6,020,024) and in view of the admitted prior art (pages 1-4). Applicant respectfully notes that all the claims at issue in this rejection have been cancelled herein.

Claims 29 and 37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ma et al. (U.S. Patent No. 6,207,589) in view of Park (U.S. Patent No. 5,795,808) and Yano et al. (U.S. Patent No. 5,810,923), Maiti et al. (U.S. Patent No. 6,020,024) as applied to claims 22-23, 25, 27-28, 30-31, 33 and 35-36, above and further in view of Moise et al. (U.S. Patent No. 6,211,035). Applicant respectfully notes that all the claims at issue in this rejection have been cancelled herein.

RESERVATION OF RIGHTS

In the interest of clarity and brevity, Applicant may not have equally addressed every assertion made in the Office Action, however, this does not constitute any admission or acquiescence. Applicant reserves all rights not exercised in connection with this response, such as the right to challenge or rebut any tacit or explicit characterization of any reference or of any of the present claims, the right to challenge or rebut any asserted factual or legal basis of any of the rejections, the right to swear behind any cited reference such as provided under 37 C.F.R. § 1.131 or otherwise, or the right to assert co-ownership of any cited reference. Applicant does not admit that any of the cited references or any other references of record are relevant to the present claims, or that they constitute prior art. To the extent that any rejection or assertion is based upon the Examiner's personal knowledge, rather than any objective evidence of record as manifested by a cited prior art reference, Applicant timely objects to such reliance on Official Notice, and reserves all rights to request that the Examiner provide a reference or affidavit in support of such assertion, as required by MPEP § 2144.03. Applicant reserves all rights to pursue any cancelled claims in a subsequent patent application claiming the benefit of priority of the present patent application, and to request rejoinder of any withdrawn claim, as required by MPEP § 821.04.

CONCLUSION

Applicants respectfully submit that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicants' attorney at (508) 865-8211 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being filed using the USPTO's electronic filing system EFS-Web, and is addressed to: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 23rd day of June, 2008.

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Signature